



## Summary of Fishery Surveys

### Phillips Chain of Lakes, Price County, 2007 – 2008 and 2013 – 2014

WDNR's Fisheries Management Team from Park Falls completed fyke netting and electrofishing surveys in 2007 – 2008 and 2013 – 2014 to assess the status of important fish populations in Elk, Duroy, Long, and Wilson lakes, collectively known as the Phillips Chain of Lakes. Fyke netting in October yielded useful information on black crappies. Fyke nets set shortly after the spring thaw targeted walleye, muskellunge, northern pike, and yellow perch and provided complementary information on black crappies and bluegills. Electrofishing surveys in late spring documented the abundance and size structure of smallmouth bass, largemouth bass, and bluegill populations.

### Survey Effort

#### 2007 – 2008

	Fall Fyke Nets Oct 8-11, 2007	Early Spring Fyke Nets Apr 27-May 1, 2008	Late Spring Electrofishing June 2-10, 2008			
Water Temp	57-62° F	40-47° F	62-69° F			
	Net-nights	Net-nights	Gamefish		Panfish	
			Miles	Hours	Miles	Hours
Elk	3	9	2.66	1.03	1.01	0.43
Duroy	5	15	4.12	1.50	2.60	0.90
Long	5	10	4.04	1.60	2.54	1.00
Wilson	5	5	4.15	1.80	1.05	0.40
Combined	18	39	14.97	5.93	7.20	2.73

#### 2013 – 2014

	Fall Fyke Nets Sept 30-Oct 4, 2014	Early Spring Fyke Nets Apr 27-May 3, 2014	Late Spring Electrofishing May 29-June 3, 2014			
Water Temp	59-63° F	39-44° F	69-78° F			
	Net-nights	Net-nights	Gamefish		Panfish	
			Miles	Hours	Miles	Hours
Elk	6	12	3.00	1.22	1.00	0.43
Duroy	10	10	2.90	1.20	1.40	0.50
Long	10	20	3.00	1.18	1.50	0.58
Wilson	10	10	3.10	1.38	1.05	0.52
Combined	36	52	12.00	4.98	4.95	2.03

Each survey occurred over similar ranges of water temperature in both periods, and in most cases net locations and electrofishing routes were duplicated. With the noted exceptions, we are confident that

our samples were well-timed to accurately represent their respective targets and to compare population status between years. Quality, preferred, and memorable sizes referenced in this summary are based on standard proportions of world record lengths developed for each species by the American Fisheries Society. “Keeper size” is based on known angler behavior.

## **Habitat Characteristics**

The Phillips Chain of Lakes is a 1,236-acre impoundment on the Elk River, ranking second to the Pike Lake Chain of Lakes in total surface area among Price County waters. About 40% of the Chain lies within the City of Phillips, Wisconsin. Before dam construction, the waters presently known as Duroy, Elk, and Long lakes were natural lakes on the mainstream. In their unimpounded condition, Duroy and Elk lakes had expansive surface areas and moderate depths (8 to 15 feet), whereas Long Lake had a narrow, elongated shape and a maximum depth of about 44 feet. Wilson Lake did not exist before these waters were dammed. That shallow arm of the Chain, sometimes called Wilson Creek Flowage, was formed over flooded wetlands adjacent to the Wilson Creek tributary.

Water clarity is relatively low in the Phillips Chain, indicating a fertile lake system with moderately high nutrient levels that occasionally produce mid-summer algae blooms. Average summer Secchi disk visibility ranged from 3.1 feet in Wilson Lake to 4.2 feet in Long Lake.

Public boat access to the Chain is sufficient to accommodate the demand without crowding. Improved boat landings with concrete ramps, boarding piers, and parking for vehicles and trailers provide no-fee access to Elk Lake from County Highway H and to Wilson Lake from County Highway W. Additional boat access with fewer improvements is available from several town roads and private sites on all four lakes. Most recreational watercraft, including most pontoon boats, can navigate through the large culvert under Highway W that connects Wilson Creek Flowage and Long Lake.

Despite subtle differences among lakes, we manage the Chain’s fishery as a unit with exceptions as necessary under the stakeholder-supported goals and objectives outlined in the *Fishery Management Plan—Phillips Lake Chain, February 2008*.

## **Summary of Results**

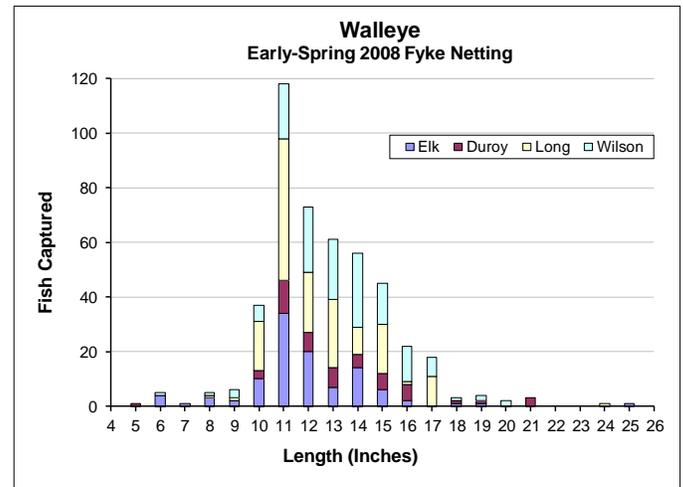
The fish community’s diversity can be attributed to the variety of habitat in the Phillips Chain and its tributaries. We captured 20 fish species in our netting and electrofishing surveys, including several riverine species. The principle predators in the Chain were walleyes, northern pike, and muskellunge. Their important prey included white suckers, northern hog suckers, shorthead redhorse, silver redhorse, golden redhorse, and yellow perch (whose cylindrical shape predators prefer) as well as young bluegills and black crappies. Catch rates of bluegill and black crappies were generally higher in 2014 than in 2008, whereas gamefish and yellow perch catch rates were higher in the 2008 survey than in 2014.

## Walleye



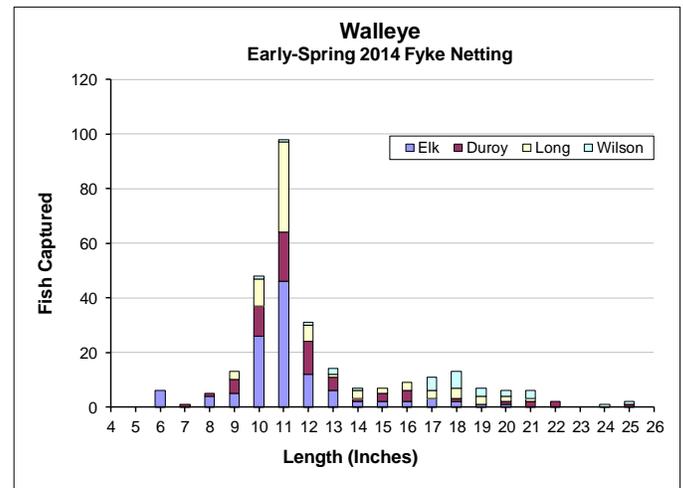
### Early-Spring Fyke Netting 2008

	Number per net-night $\geq 10''$	Quality Size $\geq 15''$	Preferred Size $\geq 20''$	Memorable Size $\geq 25''$
Elk	11	11%	1%	1%
Duroy	3.5	33%	6%	0%
Long	16	20%	0.6%	0%
Wilson	28	29%	1%	0%
Combined	12	22%	2%	0.2%



### Early-Spring Fyke Netting 2014

	Number per net-night $\geq 10''$	Quality Size $\geq 15''$	Preferred Size $\geq 20''$	Memorable Size $\geq 25''$
Elk	8.6	11%	1.0%	0%
Duroy	6.1	23%	10%	2%
Long	3.6	25%	4%	0%
Wilson	2.8	78%	26%	4%
Combined	5.1	24%	6%	0.8%



Across the entire Chain early spring fyke nets captured walleye at a rate nearly 2½ times higher in 2008 than in 2014. Long and Wilson lakes experienced the greatest declines, while catch rate increased in Duroy Lake and remained relatively unchanged in Elk Lake. We did not estimate walleye density in 2008 or 2014, so we do not know whether the population meets our objective for 3 – 5 adults per acre in the Chain; (fyke net capture rates in early spring are not statistically associated with adult walleye density).

Our indices of walleye size structure were generally within the objective range (20 – 40% at least 15 inches long), though walleye in Elk Lake fell short of the goal in both years. A proposed fishing regulation would protect and improve the size distribution of the walleye population in the Phillips Chain. Focusing angler harvest toward abundant, slow-growing walleyes of intermediate size 10 – 13 inches long while allowing conservative harvest of one walleye > 14 inches should maintain or increase the proportion of adult walleyes longer than 15 inches. If approved, the new rule would take effect in April 2016: “Walleye of any length may be kept, but only one can be over 14 inches.”

Comparing walleyes in early spring 2008 and 2014 fyke nets, the steep decline in capture rate, coupled with a sharp increase in the proportion of walleye 15 inches and longer, raise concerns about low recruitment to the sub-population in Wilson Lake since the last 2-inch fingerlings were stocked into the

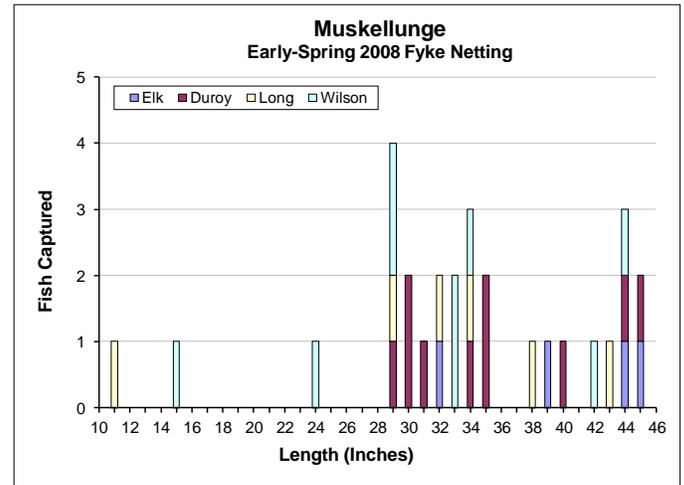
Phillips Chain in 2002 and 2004. Habitat and fish community characteristics in shallow, weedy Wilson Lake appear to be less favorable for walleye compared to the rest of the Chain, and the narrow, shallow culvert connecting these waters may limit fish movements and interactions. If fall 2019 electrofishing and early spring 2020 fyke netting surveys suggest that walleye reproductive success is still low in Wilson Lake, then we should consider stocking walleye fingerlings there again to advance our goals for the Chain’s walleye and panfish populations.

## Muskellunge



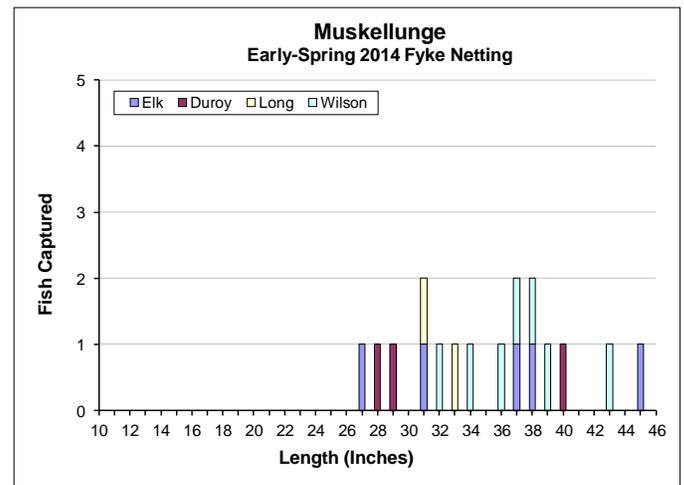
### Early-Spring Fyke Netting 2008

	Number per net-night $\geq 20''$	Quality Size $\geq 30''$	Preferred Size $\geq 38''$	Memorable Size $\geq 42''$
Elk	0.4	100%	75%	50%
Duroy	0.7	90%	30%	20%
Long	0.6	80%	40%	20%
Wilson	1.6	63%	25%	25%
Combined	0.7	81%	37%	26%



### Early-Spring Fyke Netting 2014

	Number per net-night $\geq 20''$	Quality Size $\geq 30''$	Preferred Size $\geq 38''$	Memorable Size $\geq 42''$
Elk	0.4	80%	40%	20%
Duroy	0.3	33%	33%	0%
Long	0.1	100%	0%	0%
Wilson	0.7	100%	43%	14%
Combined	0.3	82%	35%	12%



Except in Elk Lake, catch rates of muskellunge in early spring fyke nets were lower in 2014 than in 2008, though we do not believe the apparent decline points to a decrease in musky abundance. Because walleyes were our primary target in both years, fyke nets set in 2014 at average water temperature 40 – 43°F may not have represented the spawning muskellunge population’s status as well as those set in 2008 when the average water temperature we recorded throughout the Chain (40 – 47°F) was closer to the optimal temperature (55°F) at which muskies spawn. In the next surveys scheduled in 2020, we recommend shifting the primary purpose to a deliberate assessment of muskellunge size distribution and abundance by fyke netting at warmer water temperatures (49 – 60°F) later in spring (SN2 protocol) to intercept mature muskies during their spawning activities.

In spring 2008 the combined fyke net capture rate across the entire Chain ranked in the 43<sup>rd</sup> percentile statewide among Class A2 muskellunge populations that offer the best “action” fishing opportunities.

Though samples were small, the 2008 survey revealed that muskellunge had attained our objective that 15 – 30% should be 42 inches or longer. With even smaller samples in 2014 we cannot determine whether size structure has changed since 2008.

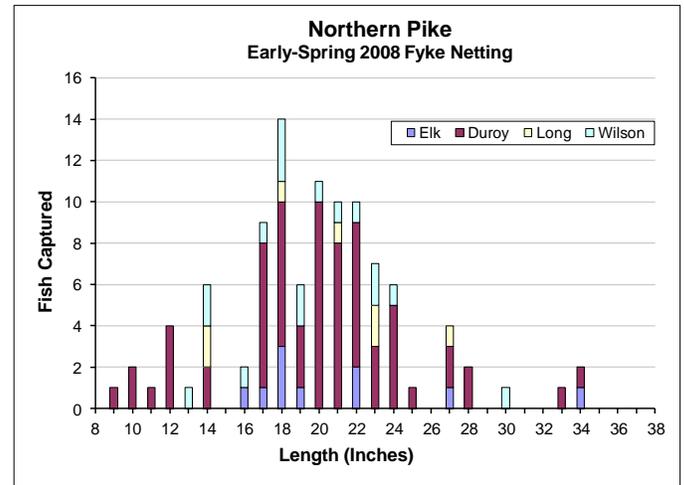
Electronic records dating to 1972 show that muskellunge were planted into the Phillips Chain almost annually for two decades at rates of 1 – 4 fingerlings per acre. Musky stocking resumed in 2003 with fewer and larger fish planted less frequently. Most recently, new recruits are added to the muskellunge population by a combination of natural reproduction and stocking large fingerlings 10 – 12 inches long at a rate of 0.5 per acre in alternate years.

## Northern Pike



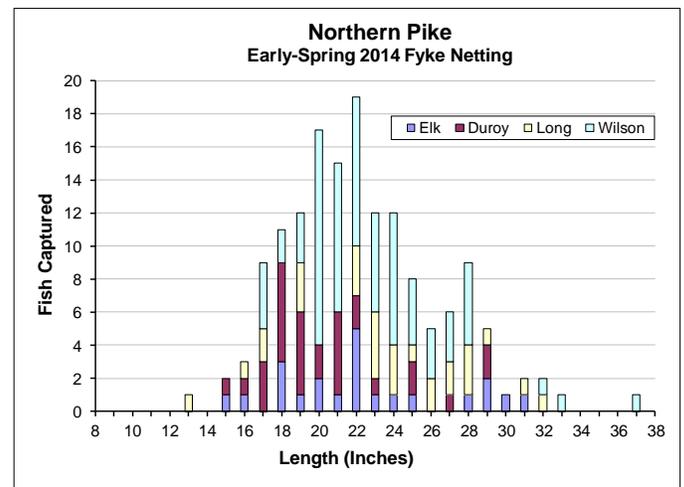
### Early-Spring Fyke Netting 2008

	Number per net-night $\geq 14"$	Quality Size $\geq 21"$	Preferred Size $\geq 28"$	Memorable Size $\geq 34"$
Elk	1.3	40%	10%	10%
Duroy	4.0	51%	7%	2%
Long	0.8	57%	0%	0%
Wilson	3.2	38%	6%	0%
Combined	2.5	48%	7%	2%



### Early-Spring Fyke Netting 2014

	Number per net-night $\geq 14"$	Quality Size $\geq 21"$	Preferred Size $\geq 28"$	Memorable Size $\geq 34"$
Elk	2.0	64%	23%	0%
Duroy	3.4	42%	6%	0%
Long	1.6	78%	22%	0%
Wilson	7.5	69%	11%	1%
Combined	3.2	64%	14%	0.7%



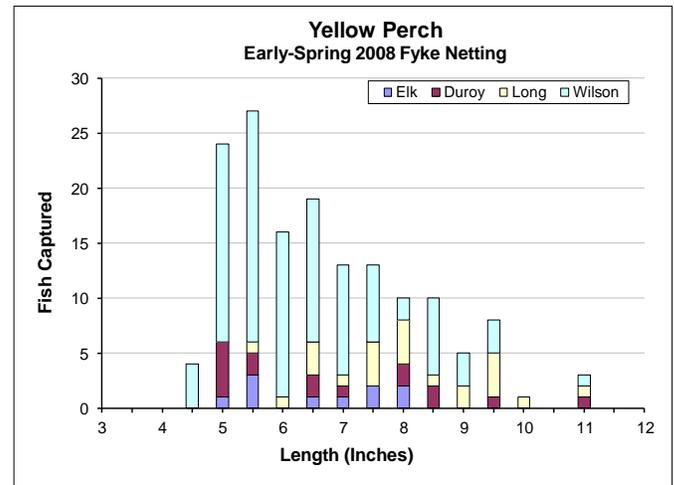
Overall, early spring fyke nets captured northern pike at a slightly higher rate in 2014 than in 2008, possibly indicating a small increase in pike abundance, or perhaps because netting in 2014 occurred at water temperatures (40 – 43°F) closer to the optimal range of pike spawning activity (34 – 40°F) than in 2008 (40 – 47°F). Catch rates in Long and Wilson lakes doubled from 5 years earlier. Any increase in pike abundance did not diminish their size structure. Rather, the proportion of pike  $\geq 28$  inches in the Chain also doubled. No goals were written for northern pike in the 2008 Fishery Management Plan as pike were of low or even negative interest to most local stakeholders. Nonetheless, at moderate density with better-than-average size structure, northern pike are easily catchable much of the time, providing additional angling opportunity in the Phillips Chain under statewide fishing regulations.

## Yellow Perch



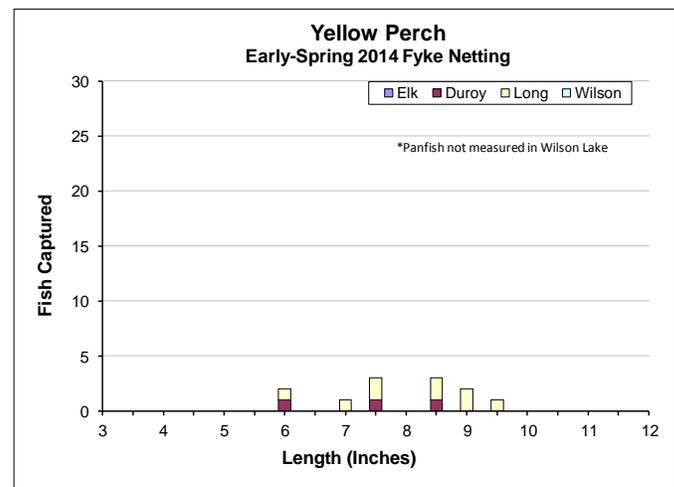
### Early-Spring Fyke Netting 2008

	Number per net-night $\geq 5''$	Quality Size $\geq 8''$	Preferred Size $\geq 10''$
Elk	1.1	20%	0%
Duroy	1.1	38%	6%
Long	2.3	57%	9%
Wilson	20	16%	1%
Combined	3.8	25%	3%



### Early-Spring Fyke Netting 2014

	Number per net-night $\geq 5''$	Quality Size $\geq 8''$	Preferred Size $\geq 10''$
Elk	0.8	56%	0%
Duroy	0.3	33%	0%
Long	1.0	56%	0%
Wilson	-	-	-
Combined	0.6	38%	0%



When yellow perch were present, their capture rate in early spring fyke nets was highly variable ( $SD = 45$ ;  $mean = 18$ ) in 49 surveys that our Team completed in 2008 – 2014. Consequently, we are not sure how to interpret these results. Nonetheless, similar fyke net capture rates indicated low yellow perch abundance in Duroy, Elk, and Long lakes in early spring 2008 and 2014. This apparent scarcity of perch may be attributed to predation by walleye, muskellunge, and northern pike, all of which prefer to eat tube-shaped perch over dish-shaped sunfish. In Wilson Lake panfish were too numerous to measure or count in spring 2014 fyke nets, but we subjectively rated perch as “moderately abundant” and similar to the level we found there in 2008 when fyke nets in Wilson Lake captured perch at the highest rate in the Chain. Compared to local lakes, both surveys showed the Phillips Chain had unusually high proportions of perch longer than 8 inches. No specific management goals were set for yellow perch in the 2008 management plan. However if approved, an experimental fishing regulation intended to increase the average size of black crappies and bluegills by allowing anglers to harvest 5 sunfish, 5 crappies, and 5 perch in a daily bag limit of 15 panfish, may also help to improve the size structure of the Phillips Chain’s yellow perch population.

## Black Crappie

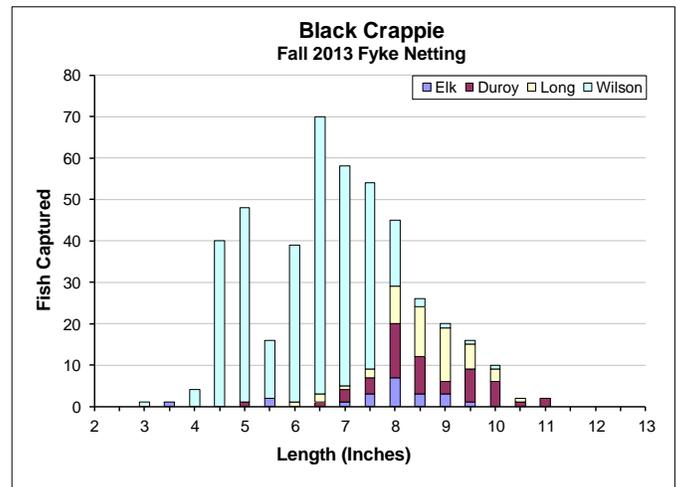
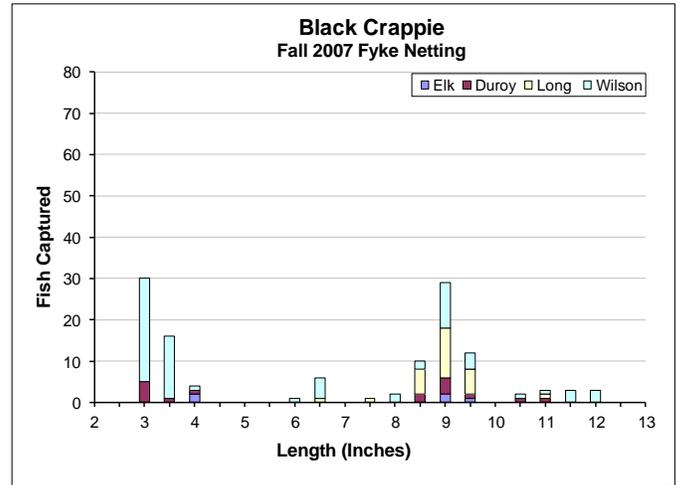


### Fall Fyke Netting 2007

	Number per net-night $\geq 5''$	Quality Size $\geq 8''$	Preferred Size $\geq 10''$	Memorable Size $\geq 12''$
Elk	1.0	100%	0%	0%
Duroy	1.8	100%	22%	0%
Long	5.4	93%	4%	0%
Wilson	6.6	82%	24%	9%
Combined	4.0	89%	15%	4%

### Fall Fyke Netting 2013

	Number per net-night $\geq 5''$	Quality Size $\geq 8''$	Preferred Size $\geq 10''$	Memorable Size $\geq 12''$
Elk	3.3	70%	0%	0%
Duroy	5.1	82%	18%	0%
Long	5.0	88%	8%	0%
Wilson	29	7%	0.4%	0%
Combined	11	30%	3%	0%



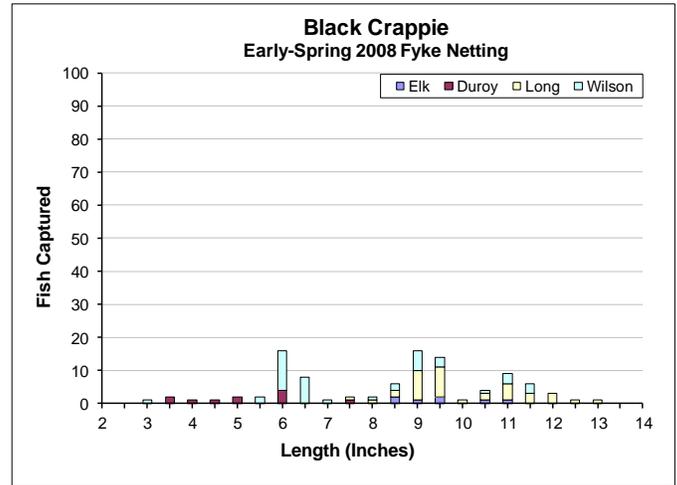
Capture rates of black crappies in fall fyke nets were about 3 – 4 times higher in 2013 than in 2007, except in Long Lake where fall catch rates were similar in both years. However, spring 2014 fyke nets revealed a higher abundance of 2- and 3-year-old crappies (presumed ages) in Long Lake that were not well represented in the fall 2013 sample. Crappies did not attain the desired range of moderate abundance (10 – 20 crappies per net-night  $\geq 5$  inches in fall fyke nets), except in Wilson Lake where crappies surpassed that goal in fall 2013. In both fall surveys crappies also fell short of our size objective (30 – 40% of crappies  $\geq 5$  inches should be 10 inches or longer). Based on ages estimated from scales taken in 2007, we can cautiously forecast better fishing opportunity for crappies throughout the Chain, especially in Long and Wilson lakes, as the strong year classes produced in 2012 and 2013 grow to the sizes that anglers prefer. From casual observations we believe crappies in the Phillips Chain receive moderate, but consistent fishing pressure. In our opinion, it is unlikely that we will achieve our crappie population objectives under current regulations that permit anglers to harvest 25 panfish daily with no minimum length limit. A pending proposal to limit angler harvest to 5 crappies, 5 sunfish, and 5 yellow perch in a daily bag limit of 15 panfish combined, should serve to improve crappie size structure, moderate the extremes of fluctuating crappie abundance, and distribute the harvest more equitably among anglers who frequent the Phillips Chain. If approved, the new fishing regulation would take effect in April 2016.

## Black Crappie



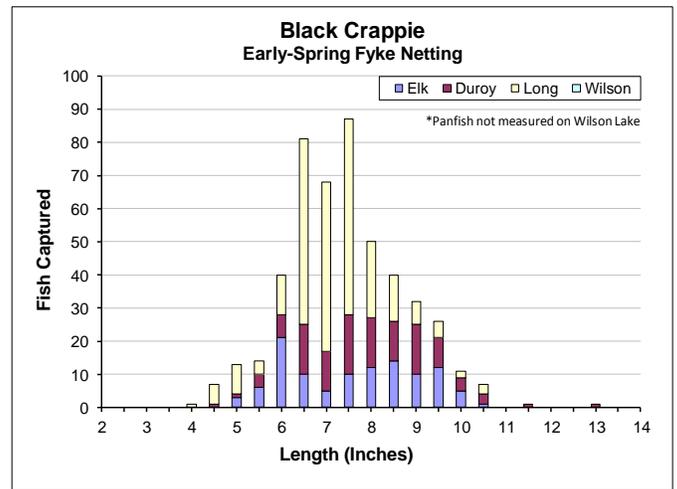
### Early-Spring Fyke Netting 2008

	Number per net-night $\geq 5"$	Quality Size $\geq 8"$	Preferred Size $\geq 10"$	Memorable Size $\geq 12"$
Elk	0.8	100%	29%	0%
Duroy	0.5	0%	0%	0%
Long	3.8	97%	42%	13%
Wilson	8.4	45%	17%	0%
Combined	2.4	67%	27%	5%



### Early-Spring Fyke Netting 2014

	Number per net-night $\geq 5"$	Quality Size $\geq 8"$	Preferred Size $\geq 10"$	Memorable Size $\geq 12"$
Elk	9.1	50%	6%	0%
Duroy	12	51%	8%	0.9%
Long	28	22%	2%	0%
Wilson	-	-	-	-
Combined	15	36%	4%	0.2%

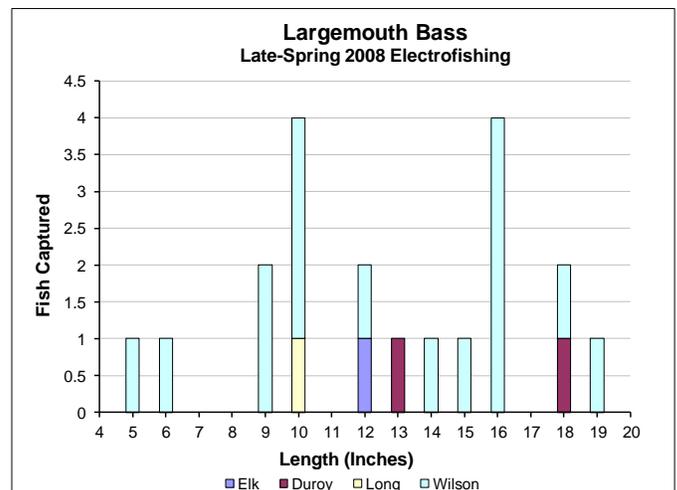


## Largemouth Bass



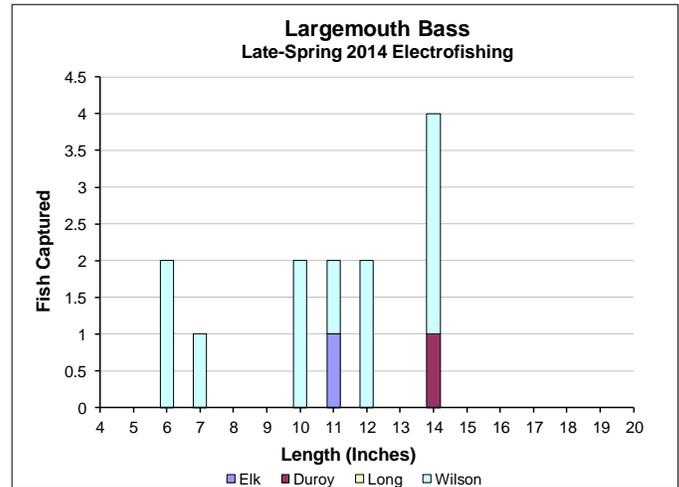
### Late-Spring Electrofishing 2008

	Number per mile $\geq 8"$	Number per hour $\geq 8"$	Quality Size $\geq 12"$	Preferred Size $\geq 15"$
Elk	0.4	1.0	100%	0%
Duroy	0.5	1.3	100%	50%
Long	0.2	0.6	0%	0%
Wilson	3.4	7.8	64%	50%
Combined	1.2	3.0	67%	44%



### Late-Spring Electrofishing 2014

	Number per mile $\geq 8''$	Number per hour $\geq 8''$	Quality Size $\geq 12''$	Preferred Size $\geq 15''$
Elk	0.3	0.8	0%	0%
Duroy	0.3	0.8	100%	0%
Long	0	0	0%	0%
Wilson	2.6	5.8	63%	0%
Combined	0.8	2.0	60%	0%



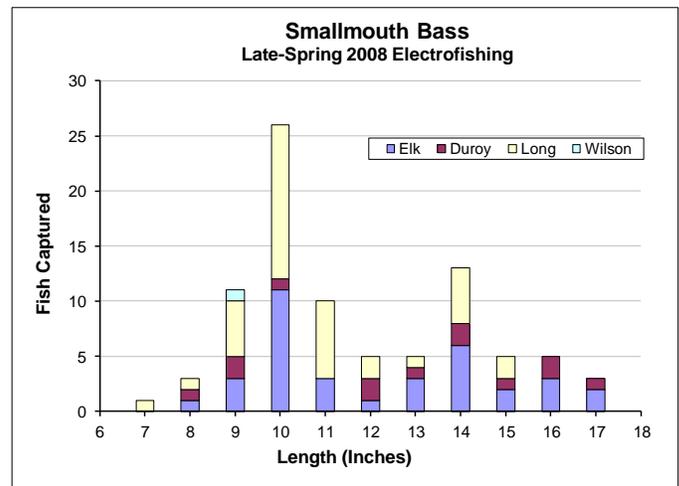
Not surprisingly, electrofishing capture rates in late spring 2008 and 2014 indicated largemouth bass at very low abundance throughout the Chain. Habitat and fish community characteristics in this system do not favor largemouth bass reproduction and survival. Predictably, in both years our electrofishing catch rate of largemouth bass was highest in shallow, weedy Wilson Lake, where habitat seems better suited for largemouth bass. At such low abundance largemouth bass should attain preferred size and add diversity to the fishery without compromising our ability to attain objectives for more important species.

### Smallmouth Bass



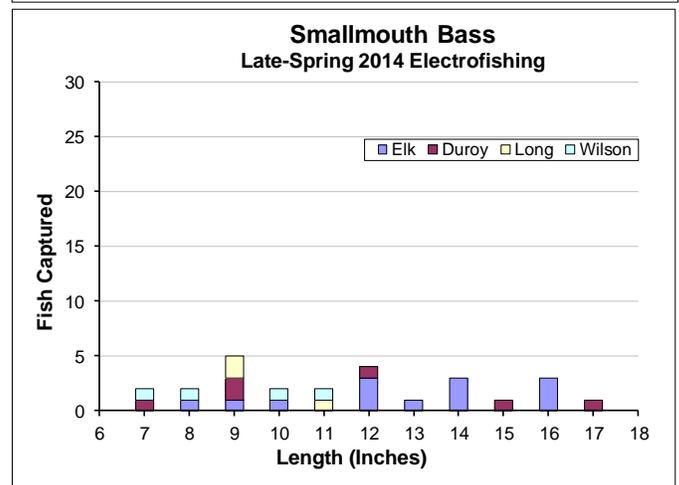
### Late-Spring Electrofishing 2008

	Number per mile $\geq 7''$	Number per hour $\geq 7''$	Quality Size $\geq 11''$	Preferred Size $\geq 14''$	Memorable Size $\geq 17''$
Elk	13	34	57%	37%	6%
Duroy	3.2	8.7	69%	46%	8%
Long	9.4	24	45%	18%	0%
Wilson	0.2	0.6	0%	0%	0%
Combined	5.8	15	53%	30%	3%



### Late-Spring Electrofishing 2014

	Number per mile $\geq 7''$	Number per hour $\geq 7''$	Quality Size $\geq 11''$	Preferred Size $\geq 14''$	Memorable Size $\geq 17''$
Elk	4.3	11	77%	46%	0%
Duroy	2.1	5.0	50%	33%	17%
Long	1.0	2.5	33%	0%	0%
Wilson	1.3	2.9	25%	0%	0%
Combined	2.2	5.2	58%	31%	4%



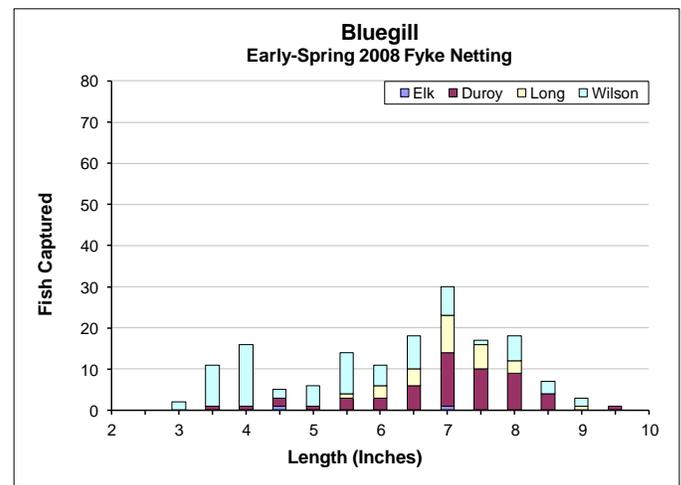
Late spring electrofishing surveys in 2008 and 2014 both revealed that the Phillips Chain’s smallmouth bass population fell far short of the goals set in the *2008 Fishery Management Plan*, suggesting perhaps that our objectives for abundance (25 – 50 smallmouth bass  $\geq$  7 inches per electrofishing hour) and size structure (50 – 70% at least 14 inches long) may be too ambitious in comparison to the area’s highest quality smallmouth bass fisheries. Most recently Elk Lake had the highest smallmouth bass abundance and best size structure of the four lakes. We do not know why overall our electrofishing capture rate decreased nearly two-thirds from 2008 to 2014, though it’s possible that crayfish, the favorite food of smallmouth bass, had experienced a similar decline. Because of the strong catch-and-release ethic among bass anglers, we suspect that few bass are taken under statewide harvest regulations. A late spring 2014 survey in nearby Solberg Lake in the same watershed revealed that smallmouth bass there also did not attain objectives for size and number. If our spring 2020 surveys show similar results in these waters, we should revise the Fishery Management Plans to reflect more realistic objectives for their smallmouth bass populations.

## Bluegill



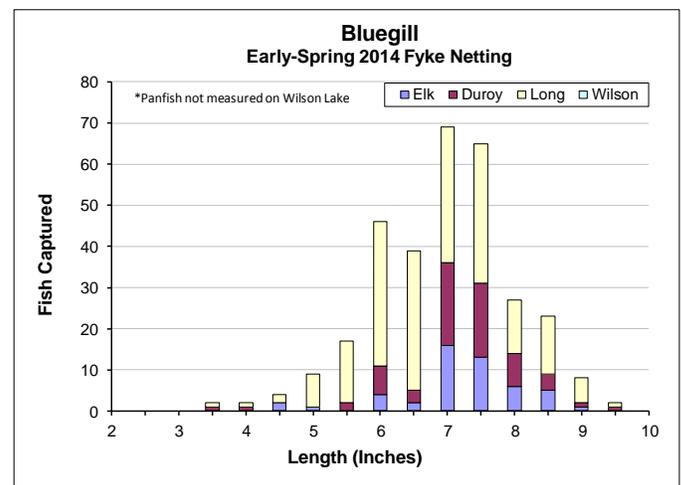
### Early-Spring Fyke Netting 2008

	Number per net-night $\geq$ 3"	Quality Size $\geq$ 6"	Keeper Size $\geq$ 7"	Preferred Size $\geq$ 8"
Elk	0.2	50%	50%	0%
Duroy	3.6	85%	69%	26%
Long	2.7	96%	70%	15%
Wilson	15	42%	25%	14%
Combined	4.1	66%	48%	18%



### Early-Spring Fyke Netting 2014

	Number per net-night $\geq$ 3"	Quality Size $\geq$ 6"	Keeper Size $\geq$ 7"	Preferred Size $\geq$ 8"
Elk	4.2	94%	82%	24%
Duroy	6.6	94%	79%	21%
Long	20	86%	51%	17%
Wilson	-	-	-	-
Combined	9.8	89%	62%	19%



In Elk, Duroy, and Long lakes electrofishing capture rates of bluegills in late spring 2008 and 2014 were near the objective range (50 – 100 bluegill  $\geq$  3 inches per hour) selected to represent the desired moderate population abundance. The same measures indicated very high bluegill abundance in Wilson Lake. In both periods bluegills attained or nearly attained the desired size structure (5 – 10% at least 8 inches) in the three lakes with moderate abundance. Wilson Lake had the highest bluegill abundance

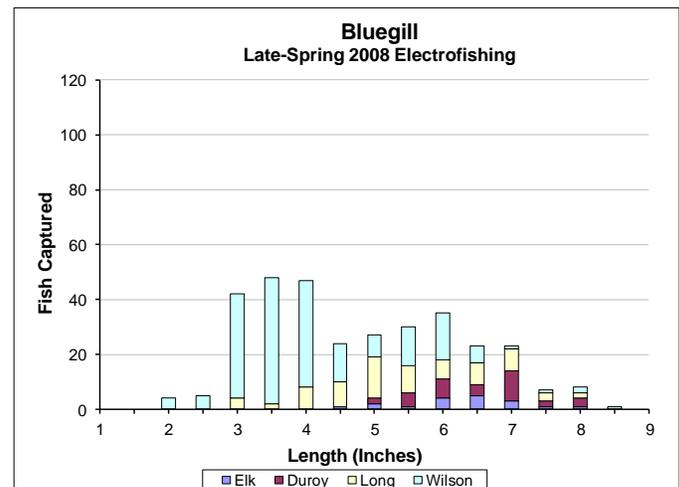
and the lowest proportions keeper- and preferred-size bluegills longer than 7 and 8 inches. The noted differences in bluegill abundance and size between Wilson Lake and the rest of the Chain are probably related to differences in habitat and the effectiveness of predators to control panfish density. Early spring fyke nets captured higher percentages of large bluegills than late spring electrofishing did. A regulation intended to increase the average length of bluegills in the Phillips Chain by allowing anglers to harvest 5 sunfish, 5 black crappies, and 5 yellow perch in a daily bag limit of 15 panfish will take effect in April 2016, if approved.

## Bluegill



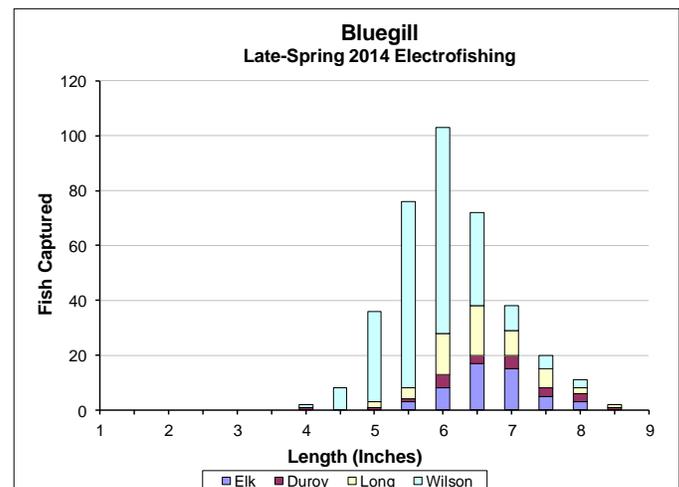
### Late-Spring Electrofishing 2008

	Number per mile $\geq 3''$	Number per hour $\geq 3''$	Quality Size $\geq 6''$	Keeper Size $\geq 7''$	Preferred Size $\geq 8''$
Elk	18	42	78%	28%	6%
Duroy	13	38	79%	47%	9%
Long	30	76	37%	17%	3%
Wilson	178	468	15%	3%	2%
Combined	44	115	31%	12%	3%



### Late-Spring Electrofishing 2014

	Number per mile $\geq 3''$	Number per hour $\geq 3''$	Quality Size $\geq 6''$	Keeper Size $\geq 7''$	Preferred Size $\geq 8''$
Elk	51	119	94%	45%	6%
Duroy	16	46	87%	52%	17%
Long	39	100	90%	33%	5%
Wilson	225	454	53%	7%	1%
Combined	74	181	67%	19%	4%



Survey data collected and analyzed by: Bill Loeffler, Kendal Patrie, Greg Rublee, Jeff Scheirer, Jeanette Wendler, and Jess Zakovec—WDNR Fishery Team, Park Falls.

Written by: Chad Leanna—Fishery Technician and Jeff Scheirer—Fishery Biologist, December 8, 2014.

Reviewed and approved for web posting by: Mike Vogelsang—acting Hayward Field Unit Supervisor, December 16, 2014.